Notes - Modeling with Exponentials

$$f(x) = a \cdot b^{x}$$

- a: initial amount
- b: what's happening to the initial amount
- x: → when / how many times

Ex 1: A population of 35 rabbits doubles every 6 months.

A. Write an equation, $r(M)$, to represent the number of rabbits after M months.

$$r(M) = 35(2)^{\frac{M}{6}}$$

B. How many rabbits after 4 years? ($M = 48$ months)

$$r(48) = 35(2)^{\frac{48}{6}} = 35(2)^{8} = 8,960 \text{ rabbits}$$

Ex 2: Sick Rick has 18,000 bacteria in his body. His medicine kills ½ bacteria every hour. Write an equation $b(h)$ to represent the bacteria after h hours.

$$b(h) = 18,000\left(\frac{1}{2}\right)^{h}$$

Ex 3: 10 fish triple in population every 4 months

$$f(M) = 10(3)^{\frac{M}{4}}$$

Percent Growth + Decay

Reminders:

- Growth $b > 1$, "appreciate", 100% + % growth
- Decay $0 < b < 1$, "depreciate", 100% − % decay

• To turn a % into a decimal, divide by 100

$38\% = 0.38$ $4.5\% = 0.045$

Ex: I bought a house for \$120,000, but it depreciates 6% each year.

$b = 100\% - 6\% = 94\% \Rightarrow 0.94$

$$y = 120{,}000(.94)^x$$

Ex: A classic car worth \$8,000 appreciates 3.6% each year.

$b = 100\% + 3.6\% = 103.6\% \Rightarrow b = 1.036$

$$y = 8{,}000(1.036)^x$$